

WHAT IS CLAIMED IS:

1. A method of manufacturing a heat exchanger integrally brazed, the method comprising steps of:

uniformly work-hardening a plurality of three-layer aluminum alloy plates to form a plurality of work-hardened plates, each of the three-layer aluminum alloy plates having a core made of a first aluminum alloy including manganese, a sacrifice anode layer clad on one side of the core and made of a second aluminum alloy which is electro-chemically base with respect to the first aluminum alloy, and a brazing layer clad on the other side of the core and made of a brazing third aluminum alloy;

forming a fluid passage and a tank portion on each of the plurality of work-hardened plates by drawing so that the sacrifice anode layer is disposed to face a corrosive fluid and the brazing layer is disposed to face a non-corrosive fluid; and

laminating the plurality of work-hardened plates.

2. A method of manufacturing a heat exchanger integrally brazed, the method comprising steps of:

uniformly work-hardening a three-layer aluminum alloy plate to form a work-hardened plate, the three-layer aluminum alloy plate having a core made of a first aluminum alloy including manganese, a sacrifice anode layer clad on one side of the core and made of a second aluminum alloy which is electro-chemically base with respect to the first aluminum

alloy, and a brazing layer clad on the other side of the core and made of a brazing third aluminum alloy; and

forming a tube from the work-hardened plate so that the sacrifice anode layer is disposed to face a corrosive fluid and the brazing layer is disposed to face a non-corrosive fluid.

3. The method according to claim 2, wherein the tube is formed by bending.

4. A heat exchanger comprising:

a core having a plurality of tubes and a plurality of outer fins made of a first aluminum alloy, the tubes and the outer fins being alternately laminated; and

a tank separately formed from the tubes, the tank into which one end of each of the tubes is inserted, wherein:

each of the tubes is produced by the following method:

uniformly work-hardening a three-layer aluminum alloy plate to form a work-hardened plate, the three-layer aluminum alloy plate having a core made of a second aluminum alloy including manganese, a sacrifice anode layer clad on one side of the core and made of a third aluminum alloy which is electro-chemically base with respect to the second aluminum alloy, and a brazing layer clad on the other side of the core and made of a brazing fourth aluminum alloy; and

forming each of the tubes by bending the work-hardened plate so that the sacrifice anode layer is disposed to face a corrosive fluid and the brazing layer is disposed to face a

non-corrosive fluid.

5. The heat exchanger according to claim 4, wherein:

each of the outer fins is corrugated to have a plurality of parallel folds, each of the folds having a flat top through which each of the outer fins is joined to the tubes; and

a brazing material is applied in a substantially straight line to a joint surface between the flat top and the tubes.

6. The heat exchanger according to claim 4, wherein:

each of the outer fins is corrugated to have a plurality of parallel folds, each of the folds having a flat top through which each of the outer fins is joined to the tubes; and

a brazing material is applied in stripes to a joint portion between the flat top and each of the tubes.

7. The heat exchanger according to claim 4, wherein an inner fin is disposed inside each of the tubes.

8. A method of manufacturing a heat exchanger integrally brazed, the method comprising steps of:

uniformly work-hardening a plurality of two-layer aluminum alloy plates to form a plurality of work-hardened plates, each of the two-layer aluminum alloy plates having a

core made of a first aluminum alloy including manganese and a sacrifice anode layer clad on one side of the core and made of a second aluminum alloy which is electro-chemically base with respect to the first aluminum alloy;

forming a fluid passage and a tank portion on each of the plurality of work-hardened plates by drawing so that the sacrifice anode layer is disposed to face a corrosive fluid and the core is disposed to face a non-corrosive fluid; and

laminating the plurality of the work-hardened plates.

9. The method according to claim 8, further comprising a step of:

applying a brazing material to the core of each of the work-hardened plates.

10. A method of manufacturing a heat exchanger integrally brazed, the method comprising steps of:

uniformly work-hardening a two-layer aluminum alloy plate to form a work-hardened plate, the two-layer aluminum alloy plate having a core made of a first aluminum alloy including manganese and a sacrifice anode layer clad on one side of the core and made of a second aluminum alloy which is electro-chemically base with respect to the first aluminum alloy; and

forming a tube by bending the work-hardened plate so that the sacrifice anode layer is disposed to face a corrosive fluid and the core is disposed to face a non-corrosive fluid.

11. The method according to claim 10, further comprising a step of:

applying a brazing material to the core of the work-hardened plate.

12. A heat exchanger comprising:

a core having a plurality of tubes and a plurality of outer fins made of a first aluminum alloy, the tubes and the outer fins being alternately laminated; and

a tank separately formed from the tubes, the tank into which one end of each of the tubes is inserted, wherein:

each of the tubes is produced by the following method:

uniformly work-hardening a two-layer aluminum alloy plate to form a work-hardened plate, the two-layer aluminum alloy plate having a core made of a second aluminum alloy including manganese and a sacrifice anode layer clad on one side of the core and made of a third aluminum alloy which is electro-chemically base with respect to the second aluminum alloy; and

forming a tube by bending the work-hardened plate so that the sacrifice anode layer is disposed to face a corrosive fluid and the core is disposed to face a non-corrosive fluid.

13. The heat exchanger according to claim 12, wherein:

each of the outer fins is corrugated to have a plurality of parallel folds, each of the folds having a flat top through which each of the outer fins is joined to the

tubes; and

a brazing material is applied in a substantially straight line to a joint surface between the flat top and the tubes.

14. The heat exchanger according to claim 12, wherein:

each of the outer fins is corrugated to have a plurality of parallel folds, each of the folds having a flat top through which each of the outer fins is joined to the tubes; and

a brazing material is applied in stripes to a joint portion between the flat top and each of the tubes.

15. The heat exchanger according to claim 12, wherein an inner fin is disposed inside each of the tubes.

16. The heat exchanger according to claim 4, wherein:

the non-corrosive fluid is a refrigerant; and  
the core evaporates the refrigerant.

17. The heat exchanger according to claim 12, wherein:

the non-corrosive fluid is a refrigerant; and  
the core evaporates the refrigerant.

18. The heat exchanger according to claim 16, wherein a thickness of each of the tubes is set to be in a range of 0.10-0.35 mm.

19. The method according to claim 2, wherein the forming step is performed while the work-hardened plate has distortion.

20. The method according to claim 2, wherein the forming step is performed while the work-hardened plate has a distortion rate of approximately 10-20 %.